

REMARKS

New dependent claim 33 has been added. This new dependent claim is supported by the specification on page 16, lines 16-19; and page 23, line 22 to page 24, line 22. Accordingly, no new matter has been added.

Claims 2 and 7 have been objected to by the Examiner. These claims have been amended to correct the formalities identified by the Examiner.

Claims 1-6 and 32 stand rejected under 35 USC 102(b) as being anticipated by Takatori. Claim 7 stands rejected under 35 USC 103(a) as being unpatentable over Takatori in view of Kitayama. Claims 6 and 7 stand rejected under 35 USC 103(a) as being unpatentable over Tanaka in view of Kitayama. Claims 4 and 5 stand rejected under 35 USC 103(a) as being unpatentable over Tanaka in view of Takatori. These rejections are respectfully traversed.

Independent claim 1 claims a liquid crystal device “wherein the molecular initial alignment in the liquid crystal material has a parallel or almost parallel direction with respect to the alignment treatment direction for the liquid crystal material; and the liquid crystal material shows almost no spontaneous polarization which is perpendicular to the pair of substrates under the absence of an externally applied voltage.”

The “almost no spontaneous polarization” in the liquid crystal device according to the claims is described on page 23, line 22 to page 24 line 22, and may be confirmed by a method of measuring the presence of spontaneous polarization perpendicular to the substrate, as described in the specification.

The reason why it is referred to as “almost no spontaneous polarization” is that current conventional measuring methods for spontaneous polarization do not detect any clear evidence of it. Moreover, this particular invention does not use spontaneous polarization as its driving torque. Accordingly, the above-mentioned feature “almost no spontaneous polarization” in the present invention means that it has no practical contribution to an electro-optic response of the device

according to the present invention. This is the reason why the claimed device does not show a peak current at the electro-optic response thereof, as illustrated in Fig. 12 of this application.

In comparison, conventional liquid crystal devices show “polarization switching” as illustrated in Fig. 13 of this application. Accordingly, the claimed liquid crystal devices possess the feature shown in Fig. 12, and do not show “polarization switching” as illustrated in Fig. 13.

None of the cited references disclose or suggest a liquid crystal device “wherein the liquid crystal material shows almost no spontaneous polarization which is perpendicular to the pair of substrates under the absence of an externally applied voltage.”

Fig. 11 of Takatori clearly discloses that the spontaneous polarization direction 5 of liquid crystal molecule 6 can be considered to be substantially parallel to field 16 between these substrates (see col. 8, lines 57-60). This clearly proves the presence of a spontaneous polarization which is perpendicular to the pair of substrates (i.e., which is substantially parallel to field 16 between these substrates as shown in Fig. 12 of this reference). Accordingly, “polarization switching” occurs in response to the polarity change in the applied voltage direction in Takatori.

This interpretation is also supported by Figs. 7A-7C of this reference. Figs. 7A-7C clearly show that the change of the birefringence of the liquid crystal layers in the liquid crystal display cell differs according to whether a positive or negative field is applied. (See Takatori col. 6, last line to col. 7, line 4). In Takatori, “polarization switching” occurs in response to the polarity change in the applied voltage direction as the direction of the liquid crystal molecules is clearly inverted depending on the polarity of the electric field applied to the liquid crystal molecules. Such switching of the liquid crystal molecular direction clearly proves the presence of a spontaneous polarization, which is perpendicular to the pair of substrates.

Similarly, Tanaka also discloses a liquid crystal display device that possesses spontaneous polarization perpendicular to a pair of substrates under the absence of an externally applied voltage.

In this reference, FIG. 13A is a diagram that illustrates the alignment of the liquid crystal molecules when no voltage is applied; FIG. 13C is a diagram that illustrates the alignment of the liquid crystal molecules when a positive voltage is applied; and FIG. 13E illustrates the alignment of the liquid crystal molecules when a negative voltage is applied. (See Tanaka, col. 6, lines 36-43 of this reference).

Accordingly, the direction of the liquid crystal molecules is clearly switched depending on the polarity (i.e., positive and negative polarity) of the electric field to be applied to the liquid crystal molecules. Such inversion clearly proves the presence of spontaneous polarization which is perpendicular to the pair of substrates.

Kitayama (U.S. Patent No. 5,583,682) discloses a liquid crystal device for a gradational display, including: a pair of substrates each provided with an electrode, and a liquid crystal layer comprising a chiral smectic liquid crystal (i.e., ferroelectric liquid crystal) disposed between the substrates. In Kitayama, the ferroelectric property of the liquid crystal material is fully exhibited. Accordingly, the device will exhibit "polarization switching" as shown in Fig. 13 of this application.

Accordingly, none of the cited references disclose a liquid crystal device "wherein the molecular initial alignment in the liquid crystal material has a parallel or almost parallel direction with respect to the alignment treatment direction for the liquid crystal material; and the liquid crystal material shows almost no spontaneous polarization which is perpendicular to the pair of substrates under the absence of an externally applied voltage."

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to withdraw the outstanding rejection of the claims and to pass this application to issue. If it is determined that a telephone conference would expedite the prosecution of this application, the Examiner is invited to telephone the undersigned at the number given below.

In the event the U.S. Patent and Trademark Office determines that an extension and/or other relief is required, applicants petition for any required relief including extensions of time and authorizes the Commissioner to charge the cost of such petitions and/or other fees due in connection with the filing of this document to **Deposit Account No. 03-1952** referencing docket no. **350292001900**.

Dated: November 20, 2006

Respectfully submitted,

By 

Jonathan Bockman

Registration No.: 45,640
MORRISON & FOERSTER LLP
1650 Tysons Blvd, Suite 300
McLean, Virginia 22102
(703) 760-7769